BODY SIZE PERCEPTION AND BODY SATISFACTION IN RESTRAINED AND UNRESTRAINED EATERS

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Summary—In 21 restrained and 20 unrestrained eaters body size perception was measured using the video distortion technique (VDT), the image marking procedure (IMP) and the kinesthetic size estimating apparatus (KSEA). Body satisfaction was assessed by questionnaires (Body Shape Questionnaire, Dieting scale of the Eating Attitudes Test). Restrained eaters showed no systematic over- or underestimation of the body size but less perceptual accuracy (in VDT and KSEA). Furthermore, they were clearly more dissatisfied with their bodies than unrestrained eaters. Both findings were unrelated to each other. In both groups depressive mood or thoughts seemed to be associated with body dissatisfaction but not with body size misperception. Objective body measures (body mass index, body fat content) were not related to either body size perception or body satisfaction. The findings suggest that a perceptual uncertainty in regard to body size (either for visual or for somatosensory aspects) has already developed in restrained eaters, which may constitute a predisposition for more overt forms of body size misperception as found in eating disorder patients.

INTRODUCTION

The concept of restrained eating has been introduced to describe a type of eating behaviour that is governed by cognitive dieting rules rather than by hunger and appetite. The primary goal of restrained eating is the prevention of weight gain and the promotion of weight loss; however, bouts of excessive eating are very often the consequence of the dieting periods. The concept was originally formulated to explain binge eating in obesity but meanwhile has also been used in regard to binging in normal weight populations (for reviews see: Herman & Polivy, 1988; Polivy & Herman, 1985). Furthermore, restrained eating has gained increasing interest because this behaviour seems to be a predisposition for the development of bulimia nervosa (Tuschl, 1990; Wardle, 1987; Westenhöfer & Pudel, 1989). Besides its pathological significance, the concept of restrained eating has proven to be useful in assessing the physiological and psychological consequences and prerequisites of epidemic dieting in the developed countries. On the physiological level, restrained eating is associated with a variety of metabolic and endocrine alterations (Pirke, Tuschl, Spyra, Lässle, Schweiger, Broocks, Sambauer & Zitzelsberger, 1990; Schweiger, 1991; Tuschl, Platte, Lässle, Stichler & Pirke, 1990b). On the psychological level, an eating behaviour with altered food preferences and a high variability of caloric intake as well as an increased concern about weight and shape are the main features of restrained eating (Lässle, Tuschl, Waadt & Pirke, 1989b; Tuschl, Lässle, Platte & Pirke, 1990a).

Despite the considerable research activities, the relation of restrained eating to body image disturbances has rarely been investigated. This is the more surprising as body image disturbances have repeatedly been assumed to be of importance for the development of eating disorders (for reviews see: Hsu & Sobkiewicz, 1991; Meermann & Vandereycken, 1988). To our knowledge, only two studies are available. Counts and Adams (1985) studied 12 restrained and 12 unrestrained eaters [classification according to the Restraint Scale of Herman and Polivy (1975)] with a photo silhouette distortion technique. There was no over- or underestimation of the actual body size by the restrained eaters compared to the unrestrained eaters, but less accuracy in estimation. Furthermore, restrained eaters appeared to be more dissatisfied with their body size than unrestrained eaters. In contrast, Lindholm and Wilson (1988), using a video distortion technique, found that unrestrained eaters ($n = 12$) underestimated their actual body size while restrained eaters ($n = 12$) were more accurate in estimating. They used the Three-Factor Eating Questionnaire of

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Stunkard and Messick (1985) for group distinction. Again, there was less body satisfaction in the restrained eaters. The conflicting results with regard to body size estimation are not easy to explain. Either differences in the definition of restrained eating or differences in the assessment of body size perception or both may be responsible. The problem that the various methods of body size estimations produce only weakly related results is widely known and, hence, some authors hold the view that it is necessary to use several methods for measuring body size perception (Meermann, Vandereycken & Napierksi, 1986; Warah, 1989).

For this reason, we investigated the body size perception of restrained and unrestrained eaters using three methods [video distortion technique (VDT), image marking procedure (IMP), kinesthetic size estimating apparatus (KSEA)]. The former findings suggest that over- or underestimation and perceptual accuracy may be different aspects of body size perception. Therefore, in addition to the usual body perception index [(subjective body size/objective body size) × 100], an error score was used (absolute value of the deviation of the body perception index from 100). Our assumption was that body size misperception must not necessarily result in systematic over- or underestimation but, primarily, in an increased error score. Systematic over- or underestimation may be due to an interaction between the perceptual deficits and additional affective or motivational biasing influences.

We decided to classify restrained/unrestrained eating according to the scale Cognitive Restraint of Eating of the Three-Factor Eating Questionnaire (Stunkard & Messick, 1985) because this scale has proven to reflect not only the motivation but also the behaviour of dieting (Lässle, Tuschl, Kotthaus & Pirke, 1989a). In addition, various scales measuring disturbed eating behaviour, body satisfaction, depression and anxiety were employed. Thereby answers could be given to the questions of whether body size estimation and body satisfaction are related and whether either variable is influenced by the level of depression as was assumed by other authors (Garner, Garfinkel & Bonato, 1987). Furthermore, the influence of objective body measures on body size estimation and body satisfaction was assessed.

METHODS

Subjects

Recruiting was done by advertisement. A German version of the Three-Factor Eating Questionnaire (TFEQ) (Stunkard & Messick, 1985) called 'Fragebogen zum Eßverhalten' (Pudel & Westenhöfer, 1989) including some anthropometric questions was mailed to the responding women. The *S*s were selected out of 97 returned questionnaires according to the criteria 'normal weight' (body mass index between 19 and 24; Bray, 1978) as well as having scored 4 or less on the scale Cognitive Restraint of Eating (TFEQ-Restraint) for unrestrained eaters and 11 or more for restrained eaters. The cut-off scores correspond to the 25th and 75th percentiles of a population of young women (Pudel & Westenhöfer, 1989). 41 *S*s fulfilled the criteria (21 classified as restrained, 20 as unrestrained). The basic description of the sample is given in Table 1. All *S*s gave written informed consent and assured that they had not suffered from an eating disorder at any time. The *S*s were paid for their participation.

Apparatus and procedure

Sessions started at 9.30 a.m., 11.30 a.m. and 1.30 p.m. To avoid error variance due to the time of day, equal sized groups of restrained and unrestrained eaters were investigated at those three times. Possible menstrual variations were controlled by fixing the day of investigation with the same frequency for both groups in the postmenstrual, follicular and luteal phase.

At the beginning of each session the *S*s had to fill out German versions of the following questionnaires: the Eating Attitudes Test (26 items version; Garner, Olmsted, Bohr & Garfinkel, 1982) with the scales Dieting (EAT-Dieting), Bulimia and Food Preoccupation (EAT-Bulimia), Oral Control (EAT-Oral Control) and the total score (EAT-Total), the Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper & Fairburn, 1987), a short form of the Beck Depression Inventory (BDI; Beck & Beck, 1972) and the Depression Scale (DS; von Zerssen, 1986). The State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch & Lushene, 1970) was applied in its state version (X-1) to control for the emotional impact of the *S*'s expectancy. From the Three-Factor Eating

Table 1. Sample description (mean ± SD) giving the selection criterion TFEQ—Restraint (only variable, for which no t-test was computed), age, body measures, scales of eating pathology and body satisfaction as well as scales of depression and anxiety

	Restrained eaters ($n = 21$)	Unrestrained eaters ($n = 20$)
TFEQ—Restraint	14.8 ± 3.0	2.2 ± 1.4
Age (yr)	23.4 ± 2.1	24.1 ± 2.6
BMI-actual†	20.9 ± 1.4	20.9 ± 1.3
BMI-maximal‡	22.2 ± 1.9	21.7 ± 1.6
BMI-minimal§	18.7 ± 1.6	19.4 ± 1.1
Body fat content (%)	28.0 ± 3.1	26.8 ± 3.2
EAT-Dieting	10.0 ± 8.3	1.3 ± 1.1***
EAT-Bulimia	1.5 ± 2.3	0.3 ± 1.1*
EAT-Oral control	2.4 ± 2.2	0.6 ± 1.0**
EAT-Total	13.9 ± 11.5	2.1 ± 2.1***
TFEQ-Disinhibition	6.7 ± 3.2	4.7 ± 3.6
TFEQ-Hunger	4.9 ± 2.5	4.5 ± 3.0
BSQ	86.8 ± 26.5	56.9 ± 20.1***
BDI	2.5 ± 4.1	2.3 ± 2.7
DS	6.3 ± 5.9	4.8 ± 4.0
STAI-X 1	37.0 ± 7.3	32.8 ± 7.0

BMI: Body Mass Index (kg/m^2); EAT: Eating Attitudes Test; TFEQ: Three-Factor Eating Questionnaire; BSQ: Body Shape Questionnaire; BDI: Beck Depression Inventory; DS: Depression Scale; STAI: State-Trait Anxiety Inventory.
*$P \leq 0.05$; **$P \leq 0.01$; ***$P \leq 0.001$ (t-test).
†Date of investigation.
‡Maximal value since age of 15 yr.
§Minimal value since age of 15 yr.

Questionnaire the scales TFEQ-Disinhibition and TFEQ-Hunger were used in the statistics (TFEQ-Restraint served only as the selection criterion).

Somatosensory tests followed, which, however, are not described here. At the beginning of the session testing body size perception, the S put on a close-fitting, black gymnastic dress. All tests were announced as perceptual tasks relating to body size. The investigators were female.

We used a procedure similar to that described by Bowden, Touyz, Rodriguez, Hensley and Beumont (1989) for the video distortion technique (VDT). A frontal photograph was taken by a Polaroid instant camera, which showed the S from the head to the knees; the S was photographed standing upright in front of a white wall with a neutral face expression. The photograph was placed into a black frame to avoid cues from the picture size. A video camera with a zoom lens scanned the photograph and the signal was fed into a television monitor. The investigator could distort the picture on the screen in the horizontal plane from 60 to 140% of the original size by slowly turning a control-dial. There were 4 trials, two starting from 60% and two from 140%; ascending and descending trials alternated. The instruction was: "You are now seeing your picture on the screen in a distorted way. I will change your picture. When you think that it looks like how you perceive yourself then say 'stop'." The average of the 4 trials was taken as the measure of the VDT and can be considered as an equivalent of the body perception index [BPI; (subjective body size/objective body size) × 100] of other body size estimation techniques.

The image marking procedure (IMP) followed. The S stood in front of a board with a marker in each hand; the investigator stood behind her. The S had to mark her perceived body width at the levels of the chest, waist, hips and thighs. The investigator touched the corresponding body sites. The instruction was: "Imagine that you are standing in front of a mirror. I will touch two points of your body simultaneously. Using both markers attempt to mark those points simultaneously at the positions where you would see them in the mirror." The BPI was computed for each body site separately; the average of the 4 BPIs was the measure of the IMP.

For the last test a modification of the kinesthetic size estimation apparatus (KSEA) described by Gleghorn, Penner, Powers and Schulman (1987) was used. The apparatus consisted of two handles gliding on a horizontal metal bar, which was adjusted to the height of each S's shoulder. A tape measure was fixed on the bar. To move a handle a force of 2 kp was necessary. The blindfolded S stood in front of the bar and was told to grasp both handles. At the beginning of each test the handles had a distance of 8 cm from each other for ascending trials and 67 cm for descending trials. The body width at the levels of the chest, waist, hips and thighs had to be

estimated in 4 trials respectively, alternating between ascending and descending trials. The investigator touched the body sites in the same way as in the IMP. The instruction was: "I will touch two points of your body simultaneously. Move the handles apart (ascending trial) or together (descending trial) in a way that your body would fit exactly between the handles at the points touched. Then drop the handles." For each body site the BPI was computed by averaging the 4 trials, then the total average was taken as the measure of the KSEA.

As a measure of the accuracy of the perception in each body size estimation test an error score (BPI-Error) was calculated by taking the absolute value of the difference between the individual BPI and 100.

The body fat content was determined according to the method of Durning and Womersley (1974): skinfold thickness was measured at four sites, biceps, triceps, subscapular and supra-iliac by a calliper (Ponderal, Leiden) and then averaged. The body fat content was read from the correspondence table of Durning and Womersley.

For evaluation t-tests and Pearson correlations were computed. Two-sided testing was used.

RESULTS

Restrained and unrestrained eaters did not differ in age or in any of the body measures and, accordingly, were comparable in this respect (see Table 1). All EAT scores suggested that the restrained eaters had significantly greater eating pathology than the unrestrained eaters (see Table 1). The most pronounced and highly significant difference was found for the scale EAT-Dieting. This finding validated our classification of restrained/unrestrained eating according to the scale TFEQ-Restraint. In contrast, no group differences were observed for the other scales of the TFEQ (TFEQ-Disinhibition, TFEQ-Hunger). The scales measuring depression and anxiety also revealed no group differences (see Table 1).

In both measures of body satisfaction, the BSQ and the EAT-Dieting scale [according to Garner *et al.* (1982) the scale EAT-Dieting does not only measure dieting motivation but also body satisfaction], restrained and unrestrained eaters differed highly significantly (see Table 1). Hence, the former seemed to be much more dissatisfied with their bodies than the latter. Both measures correlated with $r = 0.82$ ($P < 0.001$) in the restrained group and with $r = 0.52$ ($P = 0.020$) in the unrestrained group.

For body size perception, the BPIs as measures of over- or underestimation were evaluated first: no significant group differences were obtained for the video distortion technique (VDT; $P = 0.759$), for the image marking procedure (IMP; $P = 0.961$) or for the kinesthetic size estimating apparatus (KSEA; $P = 0.109$) (see Fig. 1). In contrast, the BPI-Errors, as measures of the perception

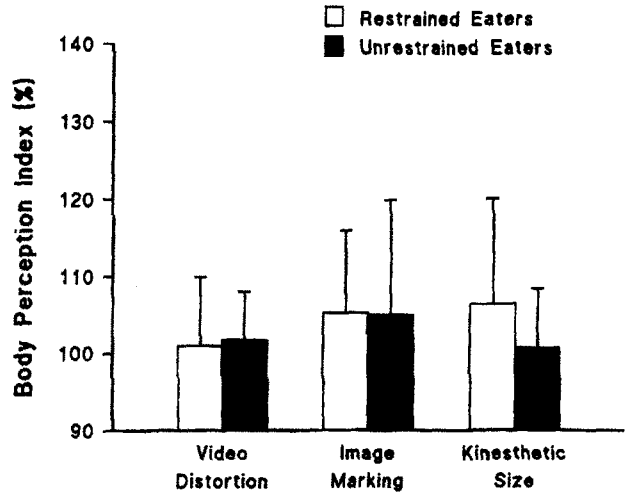

Fig. 1. Body perception index [(subjective body size/objective body size) × 100] in restrained ($n = 21$) and unrestrained ($n = 20$) eaters assessed by video distortion technique, image marking procedure and kinesthetic size estimating apparatus (mean + SD).

accuracy, were significantly greater in the restrained than in the unrestrained group for two of the three perception techniques (VDT: $P = 0.020$; KSEA: $P = 0.049$; IMP: $P = 0.172$; see Fig. 2). The intercorrelations between VDT, IMP and KSEA were generally weak, both for BPI and BPI-Error (see Table 2); only the BPIs of IMP and KSEA showed some stronger relations (significant only for the restrained eaters). Another exception was a very high correlation between the BPI-Errors of VDT and KSEA in the unrestrained group, which was not the case in the restrained group.

As restrained eaters showed more body dissatisfaction and partially greater inaccuracy in body size perception, the interrelations of both groups of variables (BSQ, EAT-Dieting and BPI-Errors in VDT, IMP and KSEA) were assessed. Neither in the restrained group (correlations ranged from $r = -0.16$ to $r = 0.09$) nor in the unrestrained group (correlations ranged from $r = -0.35$ to $r = 0.06$) did any correlation yield statistical significance. However, for the relation of the body satisfaction measures (BSQ, EAT-Dieting) and the BPIs of VDT, IMP and KSEA some significant correlations were obtained (restrained eaters: EAT-Dieting × BPI of IMP, $r = -0.58$ with $P = 0.006$; unrestrained eaters: EAT-Dieting × BPI of VDT, $r = 0.49$ with $P = 0.030$ and BSQ × BPI of KSEA, $r = -0.55$ with $P = 0.013$). These findings were not easy to understand with respect to the negative signs of two of the three significant correlations—signs that would indicate that high body dissatisfaction is associated with underestimation of body size and vice versa.

The possible influence of depression on body satisfaction and body size perception was also evaluated. The scales of depression (BDI and DS) were significantly intercorrelated in both groups (restrained eaters: $r = 0.83$ with $P \leqslant 0.001$; unrestrained eaters: $r = 0.47$ with $P = 0.037$). For both groups significant correlations between depression and body dissatisfaction were found (see Table 3). However, in the restrained group both depression scales were related only to the BSQ and in the unrestrained group only DS was related to both measures of body satisfaction. In contrast, no significant correlations were found in either group between the depression scales and the body size perceptions measures BPI and BPI-Error gained by any of the techniques used (VDT, IMP and KSEA). Correlations ranged from $r = -0.23$ to $r = 0.35$ in the restrained group and from $r = -0.36$ to $r = 0.24$ in the unrestrained group.

The objective body measures body mass index and body fat content intercorrelated significantly (restrained eaters: $r = 0.62$ with $P = 0.003$; unrestrained eaters: $r = 0.50$ with $P = 0.025$). However, no significant correlations were observed with any of the measures of body satisfaction (BSQ, EAT-Dieting) and body size perception (BPI and BPI-Error for VDT, IMP and KSEA). The ranges of correlations were from $r = -0.26$ to $r = 0.29$ in the restrained group and from $r = -0.29$ to $r = 0.21$ in the unrestrained group.

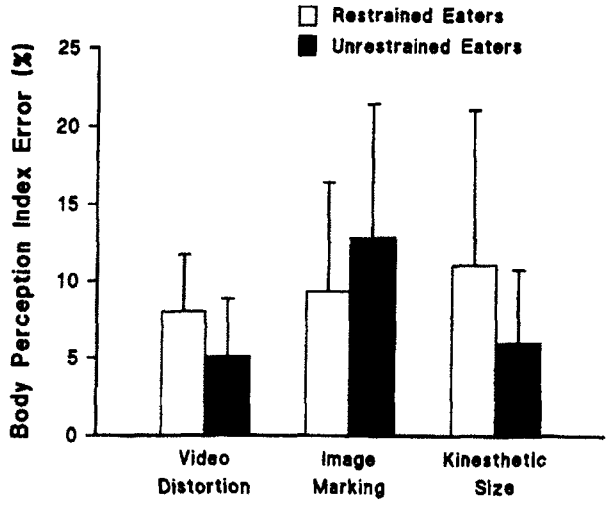

Fig. 2. Body perception index error (absolute value of the difference between the body perception index and 100) in restrained ($n = 21$) and unrestrained ($n = 20$) eaters assessed by video distortion technique, image marking procedure and kinesthetic size estimating apparatus (mean + SD).

Table 2. Intercorrelations (Pearson's r) between the body size estimation techniques for the perceptual measures BPI and BPI-Error

	BPI		BPI-Error	
	IMP	KSEA	IMP	KSEA
Restrained eaters ($n = 21$)				
VDT	−0.23	−0.05	0.09	0.26
IMP		0.45*		−0.06
Unrestrained eaters ($n = 20$)				
VDT	0.34	−0.02	0.16	0.70**
IMP		0.38		0.05

VDT: Video Distortion Technique; IMP: Image Marking Procedure; KSEA: Kinesthetic Size Estimating Apparatus; BPI: Body Perception Index.
*$P \leq 0.05$; **$P \leq 0.001$.

Table 3. Correlations (Pearson's r) between the measures of depression (BDI, DS) and of body satisfaction (BSQ, EAT-Dieting)

	Restrained eaters ($n = 21$)		Unrestrained eaters ($n = 20$)	
	BSQ	EAT-Dieting	BSQ	EAT-Dieting
BDI	0.56*	0.31	0.35	0.19
DS	0.61*	0.43	0.65*	0.67**

BDI: Beck Depression Inventory; DS: Depression Scale; BSQ: Body Shape Questionnaire; EAT: Eating Attitudes Test.
*$P \leq 0.01$; **$P \leq 0.001$.

DISCUSSION

Our samples of restrained and unrestrained eaters were very similar to those of former studies: body measure differences were minimal and although restrained eaters had clearly more eating pathology (especially enhanced dieting motivation and behaviour) they did not differ from unrestrained eaters with respect to depression (Lässle *et al.*, 1989b; Tuschl *et al.*, 1990b). According to the scores in the scales of the Eating Attitudes Test (EAT) and the Three-Factor Eating Questionnaire (TFEQ), the inadvertent inclusion of cases with a bulimia nervosa into the group of restrained eaters seems to be very unlikely (Garner *et al.*, 1982; Pudel & Westenhöfer, 1989; Whitaker, Davies, Shaffer, Johnson, Abrams, Walsh & Kalikow, 1989). *S*s with anorexia nervosa were excluded by our weight criterion.

In agreement with former studies, restrained eaters proved to be clearly more dissatisfied with their bodies than unrestrained eaters (Counts & Adams, 1985; Lässle *et al.*, 1989b; Lindholm & Wilson, 1988). As the other studies employed partially different methods from those of the present study [Body Shape Questionnatire (BSQ), EAT-Dieting scale], this finding can be considered as especially valid. [The claim of Garner *et al.* (1982) that the scale EAT-Dieting also measures body dissatisfaction was corroborated by a highly significant correlation between both scales in the restrained group.] The BSQ scores of the restrained eaters did not approach the levels reported for bulimia nervosa patients (Cooper *et al.*, 1987) and thus supported the findings of Lässle *et al.* (1989b) of an even stronger body dissatisfaction in the patients. Although in both groups the levels of depression, measured by the Beck Depression Inventory (BDI) and the Depression Scale (DS), were far below the values of clinical significance, an association to body dissatisfaction could be discerned. In the restrained group both depression scales correlated significantly with the BSQ; in the unrestrained group only the DS correlated significantly but with both the BSQ and the EAT-Dieting scale. Whether this is a chance finding or the possible result of different influences in both groups (e.g. more influences of depressive cognitions in the restrained group) cannot be determined at present. Nevertheless, interactions between depressive mood or thoughts and body dissatisfaction, which have been assumed to be a critical factor in the development of eating disorders (Garner *et al.*, 1987; McCarthy, 1990), also appeared to be of importance in the *S*s with subclinical levels of eating pathology and depression.

Concerning over- or underestimation of the body size as measured by the body perception index (BPI) no differences between restrained and unrestrained eaters were found using any of our three methods: video distortion technique (VDT), image marking procedure (IMP) or kinesthetic size estimating apparatus (KSEA). This finding agrees with that of Counts and Adams (1985), who used a photograph silhouette distortion technique, but is at odds with that of Lindholm and Wilson (1988), who used a video distortion technique similar to ours. The latter authors found a tendency of underestimation in the unrestrained group, but this tendency was observed only in one of two trials. As we found no differences when using not only one but three methods of body size estimation, it seems to be justified to state that restrained and unrestrained eaters are very similar with respect to body size over- or underestimation. Some methodological comments are appropriate at this point: the correlations between different methods of body size estimation tend to be poor and may depend on the sample characteristics as shown by our results and those of other authors

(Gleghorn *et al.*, 1987; Whitehouse, Freeman & Annandale, 1986). As the reliability figures reported for most of the methods are satisfactory (Bowden *et al.*, 1989; Gleghorn *et al.*, 1987; Meermann *et al.*, 1986), it must be assumed that the convergent validity is low or, in other words, that the different methods measure different aspects of body size perception. This fact is not too surprising as the methods differ clearly in the kind of perceptual processing involved (visual, somatosensory, etc.) and the amount of feedback given (Fichter, Meister & Koch, 1986). These arguments support the claim of some authors (Meermann *et al.*, 1986; Warah, 1989) that a multi-methods approach, as used in the present study, is the most promising one as long as no clear definition of the concept of body size perception is available (Hsu & Sobkiewicz, 1991).

In contrast to the findings on over- or underestimation, restrained eaters differed from unrestrained eaters regarding the accuracy of body size perception: in VDT and KSEA the BPI-Errors (absolute value of the deviation of the body perception index from 100) were significantly higher in the restrained group. This finding is in agreement with that of Counts and Adams (1985). However, the BPI-Errors of both methods correlated significantly only in the unrestrained group. This could mean that some restrained eaters were uncertain about their body size in a clearly visual task (VDT) and some others in a clearly somatosensory task (KSEA). As we stressed the perceptual aspect in our instructions, deficits in body size perception of different origins seem to develop parallel to other psychobiological correlates of restrained eating. One may speculate that such an uncertainty forms a kind of predisposition, which under appropriate motivational and affective influences may lead to the overt body size overestimation observed in eating disorder patients.

Objective body measures (body mass index, body fat content) were not related to body size perception or body satisfaction. Nor did Brodie and Slade (1988) find any significant correlations between various measures of body fat and body size estimation. In contrast to our findings, these authors observed that body fat was related to body dissatisfaction; however, the weight range of their *S*s was much greater than that of ours. In this context weight fluctuations in the recent past may be of more interest than the present weight status as it could be shown that restrained eaters have a more variable body weight (Heatherton, Polivy & Herman, 1991), leading to more demands on the mechanism for adapting perception of body size to objective body size. However, Gorham and Hundleby (1988) were able to demonstrate that recent weight changes do not necessarily result in body size over- or underestimation.

In summary, restrained eaters were more dissatisfied with their bodies and more uncertain about their body size in two of the three perceptual tasks than unrestrained eaters. However, systematic over- or underestimation did not occur. Whereas the level of depression seemed to interact with body dissatisfaction in the *S*s, no substantial impact of the covariates assessed on body size perception could be demonstrated. It may be assumed that the uncertainty in body size perception of restrained eaters, which seems to affect visual or somatosensory aspects, predisposes them to more overt forms of body size misperception. The overestimation of the actual body size, as observed in eating disorder patients, may then be the result of additional affective or motivational biases on the basis of those perceptual deficits.

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